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FOREST RESEARCH NOTES

U.S.DEPARTMENT OF AGRICULTURE
FOREST SERVICE
CALIFORNIA FOREST AND RANGE
EXPERIMENT STATION *

M.W.TALBOT, Acting Director

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THE BLACKS MOUNTAIN PORTABLE LOG LOADER[1/]

By

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A mobile log loader has proved to be a key piece of equipment in logging the Blacks Mountain Experimental Forest of the California Forest and Range Experiment Station. This research note describes the Blacks Mountain loader in detail for the information of potential users of this type of equipment. The loader is designed to facilitate light cutting, especially where trees susceptible to insect attack can be harvested before they become snags.

Much lighter cutting than is commonly attempted in old-growth ponderosa pine is practiced on the Blacks Mountain Experimental Forest which is situated in Lassen County on the northeastern plateau of California. Through careful selection of high-risk trees, removal of 3 thousand board feet per acre has reduced losses from bark-beetle killing by 80 percent over the 6-year period of record, as compared with losses in adjacent uncut stands. After losses were controlled, cuts were slightly heavier for silvicultural purposes. In stands averaging 17 thousand board feet of pine, the cut, by 100-acre compartments, has ranged from 2½ thousand board feet per acre to 7 thousand board feet per acre on 5,640 acres. On the major portion, or 3,330 acres, the cut has averaged 3 thousand board feet per acre. This light cutting was accomplished without seriously increasing labor or equipment costs per unit of volume.

1/ Staff members responsible for the design and construction of this loader include Davis S. Carleton, Marvin P. Hail, and Earl A. Morrow. In the preparation of this report, grateful acknowledgement is made to R. H. Langford and Lydia K. Hall of the Division of Engineering, U. S. Forest Service, California Region, for figures 3 and 4; and to M. M. DeMeyer and C. H. Gleason of this Station for assistance with the drawings of specifications and the photograph in figure 2, respectively.

Light cutting, with rapid coverage of an area, involves frequent moves of truck landings. A readily moved log loader is therefore essential to economical logging. After loading by crosshaul, ordinary A-frame, and steel industrial crane, the Blacks Mountain portable log loader was designed and built. The loader has satisfactorily handled the 17 million board feet loaded with it to date.

CONSTRUCTION

As illustrated in figures 1 and 2, the loading rig consists of an A-frame live boom mounted on a heavy log-sled base, and operated by a double-drum hoist that is mounted toward the rear on a log platform. The hoist is powered with an 85 h.p. engine. One drum carries the main line cable used in lifting logs, and the other drum carries the pull-back line controlling the position of the boom. At the end of the main lift line drum a salvaged truck wheel has been attached to serve as a drum for the squirrel line or slack puller. Details of construction and specifications of the loader are shown in figures 3 and 4[2/].

The large steel disc wheels and axle at the front end of the rig were salvaged from an industrial crane previously used in loading. These wheels are 9 feet apart center to center and together with the axle weigh a ton. They add the weight and spread of bearing surface needed to prevent the rig from tipping. The elimination of guy lines for this purpose simplifies the construction of the rig and appreciably increases the speed of getting under way on moves and setting up for operation at new landings. The wheels used were drilled and tapped for plugs so that they could be filled with water to give an additional ton of weight if necessary. The steel-rimmed wheels were found to be much superior to wheels with pneumatic tires because of wheel-bounce of rubber tires after sudden release of pressure. One precaution to observe in setting up is to be sure that the weight of the loader bears mainly on the sled base, rather than mainly on the wheels, in order to prevent "kicking out" from under while heavy logs are being lifted.

Safety guy lines, shown in figure 3, from the top of the boom to the front end of the sled eliminate any chance of pulling the boom back beyond the vertical position toward the winch.

2/ Drawings in which the scale is $2\frac{1}{2}$ times larger than in these are available at the California Forest and Range Experiment Station, 329 Giannini Hall, Berkeley.

Figure 1.- The Blacks Mountain portable log loader.

Figure 2.- Moving the Blacks Mountain loader with tractor and arch. The rate of travel averages 300 feet per minute.

OPERATION

When set on a slope, the rig is levelled by a log shoved beneath the rear end. On the gentle slope at the landing shown in figure 1, it may be noted that a small log has been used. On steeper slopes, larger logs are required.

In loading trucks, the winchman has control of the log both vertically and across the bunks. From a position over the brow log, the boom is raised and the log is lifted simultaneously to the correct position over the truck. Roughing up of trucks is kept to a minimum. Because of better control in handling logs, loading hooks pull loose less frequently than with an ordinary A-frame, so that danger to the loading crew is less.

The slack puller attachment facilitates reaching out across the landing for quick decking of logs against the brow log. This decking provides space near the loader for unhooking tractor loads and makes it possible to use less space for landings, reducing the number of reserve trees damaged or destroyed.

Moving to a new landing is accomplished by use of a yarding tractor and arch almost as quickly as unloaded tractors and arches make the move. The boom is set at the angle necessary to clear overhead limbs along the route. The tractor and arch then hook onto the rear end of the rig, hoist it, and proceed to the new landing as illustrated in figure 2. The route of travel is generally along roads, but in level going, fairly free of rocks, it is possible to cut across country. With the rear end of the loader hoisted, most of the weight bears on the pair of large wheels, permitting the load to roll along easily.

PERFORMANCE

On the Blacks Mountain project, the loader handles logs up to 38 feet in length and up to 3 thousand board feet in volume. It is capable of making a direct line lift of 12 tons.

Volume loaded per day has averaged 70 thousand board feet and has reached a maximum of 120 thousand board feet. The rig could easily maintain a schedule of 125 thousand board feet per day, including time for moving landings, if logs and trucks were continuously available. Records of loading time, based on 955 truck loads averaging 4,575 board feet and $7\frac{1}{2}$ logs per load, showed an average loading time of $13\frac{1}{2}$ minutes per truck. In table 1, average loading time is given by single logs and by thousand board feet for logs of different top diameters inside bark. Logs larger than 44 inches in diameter are generally rolled onto the bunks by the loader, rather than lifted directly.

In logging 7,800 thousand board feet in 1943, 52 moves of landings were made, averaging 1,890 feet per move. Volume loaded per landing averaged 150 thousand board feet, or about 2 days' logging output. On 32 moves, the average rate of travel was timed at 300 feet per minute, and the average time required to hook onto the rig with tractor and arch, plus setting the rig into position for loading at the new landing, was $9\frac{1}{2}$ minutes. This performance indicates that it is feasible to establish more landings than with the ordinary A-frame, and so to reduce average yarding distance.

Table 1.-Truck loading time per log and per thousand board feet.

Log d.i.b. small end	Volume - Scribner Decimal C rule	Loading time per log	Loading time per 1,000 board feet
Inches	Board feet	Minutes	Minutes
12	136	1.21	8.93
14	210	1.31	6.24
16	300	1.42	4.74
18	405	1.55	3.82
20	524	1.69	3.22
22	658	1.84	2.80
24	808	2.01	2.49
26	972	2.20	2.26
28	1,151	2.40	2.08
30	1,345	2.61	1.94
32	1,554	2.84	1.83
34	1,778	3.09	1.74
36	2,016	3.35	1.66
38	2,270	3.62	1.59
40	2,538	3.91	1.54
42	2,822	4.21	1.49
44	3,120	4.53	1.45

COST AND SUGGESTED IMPROVEMENTS

The cost of the Blacks Mountain loader is relatively low considering its portability and efficiency. The estimated cost of the major items, if purchased new, and of labor in construction is as follows:

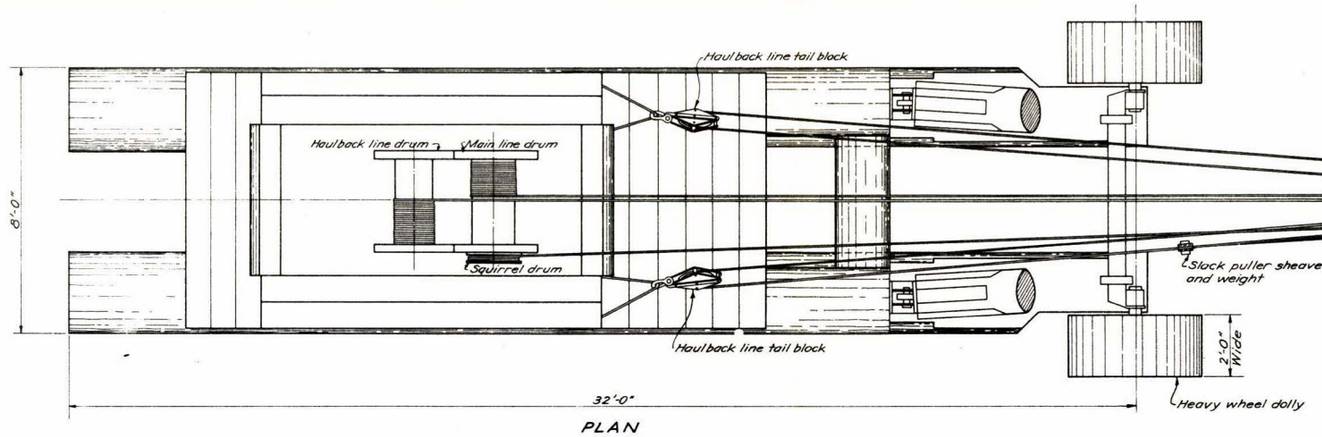
Hoist	$2,650
Wheels and axle	315
Wire rope	108
Blocks	113
	3,186
Labor	500
Total	$3,686

Small metal parts, such as channel iron, iron plates, steel pins, and bolts, can be made up from scrap material that always accumulates around logging operations. On many operations a used engine can be salvaged for operating the hoist, and other types of heavy steel wheels or old logging arch wheels and tracks substituted for new equipment.

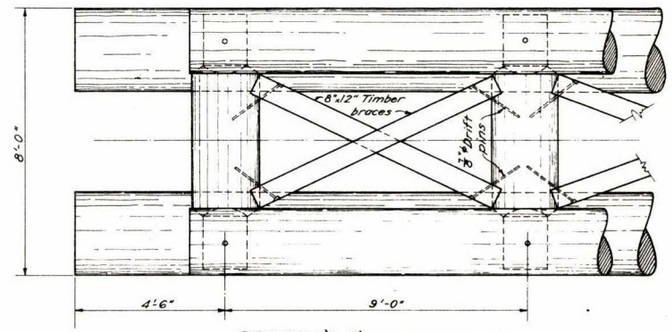
Maintenance and repair costs and lost time in connection with use of the rig have been negligible during two seasons of operation. Loading crews have found the rig easy to operate and work with.

One suggested improvement is to lower the height of the bracing of the A-frame and raise the winch platform about a foot to secure better visibility for the winchman. Suggestions offering promise of further improvement in design of the rig are solicited from readers of this research note.

Further information will be gladly supplied by this Station. This rig may be seen in operation from May to November on the Blacks Mountain operation during 1945, the headquarters of which are situated 45 miles northwest of Susanville along the Susanville-Pittville road.

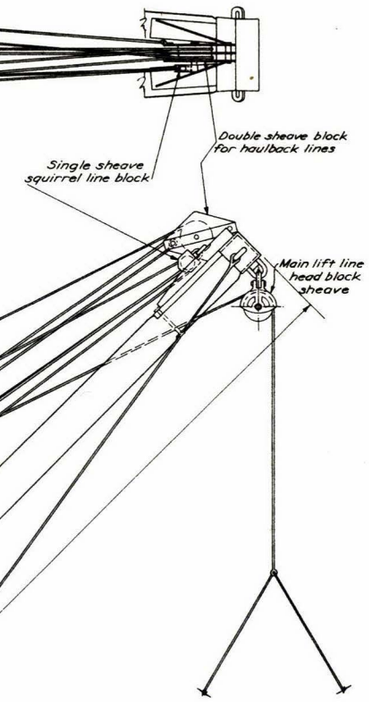


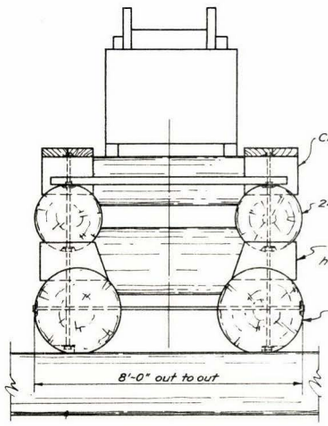
PLAN



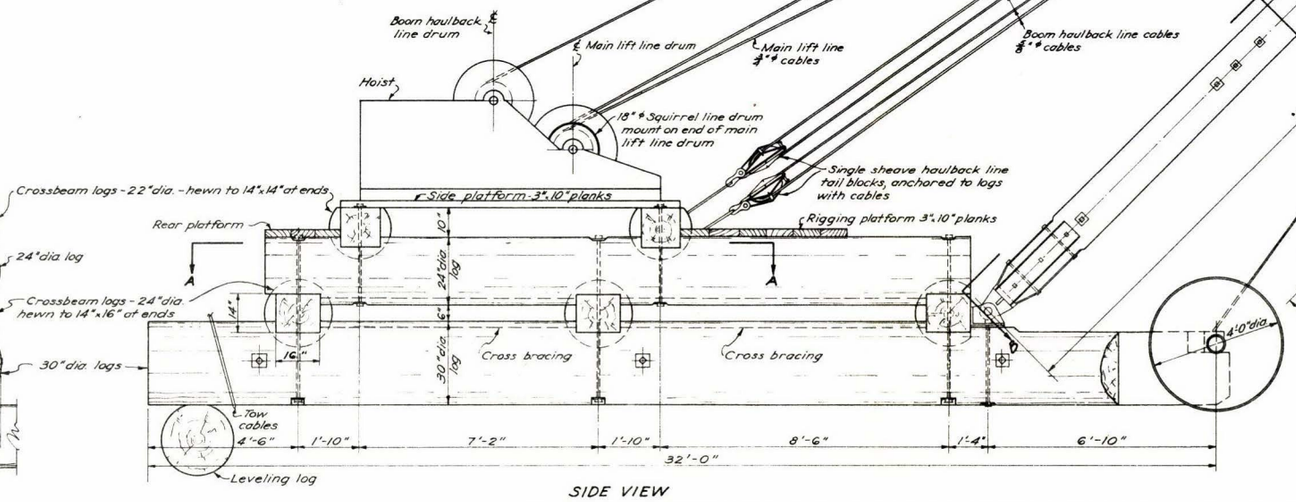
SECTION 'A-A' SHOWING TIMBER BRACING

Notes:
All timbers are Douglas Fir.
All bolts are 1" diameter framed with 6"x6"x¼" plate washers.

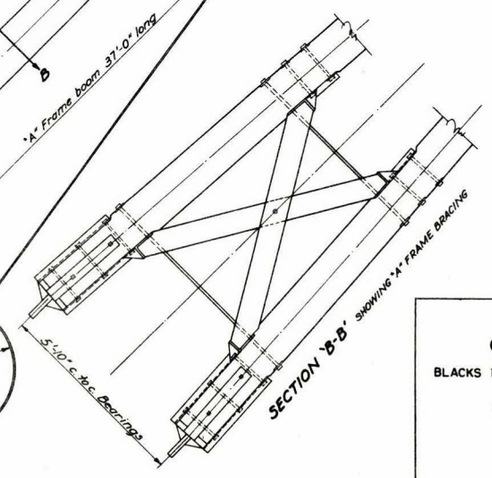

Double sheave block for haulback lines
Single sheave squirrel line block
Main lift line head block sheave
Squirrel line ¾" cable
Squirrel or slack puller. Weight in proportion to pull on drum.
Safety guy lines ¾" cables



END VIEW



SIDE VIEW



SECTION 'B-B' SHOWING 'A' FRAME BRACING

Figure 3

GENERAL ASSEMBLY

BLACKS MOUNTAIN PORTABLE LOG LOADER

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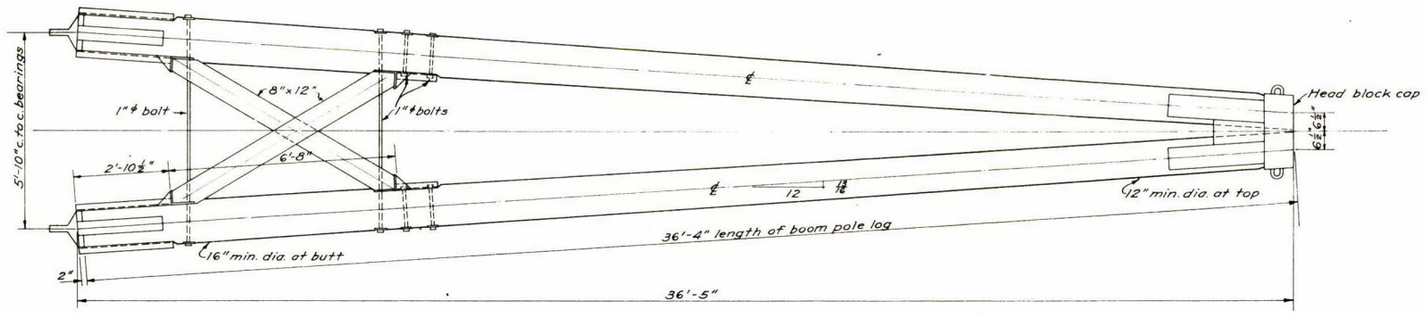
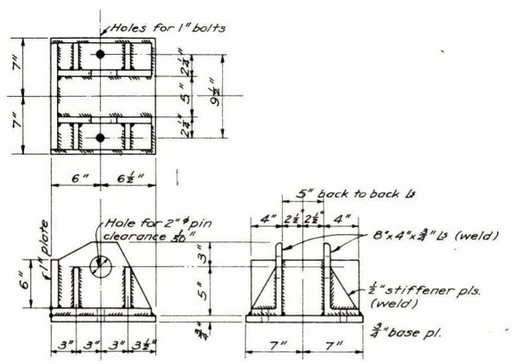
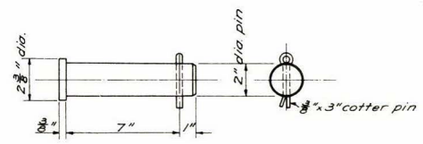


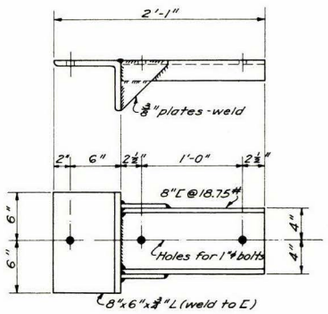
DETAIL OF 'A' FRAME BOOM



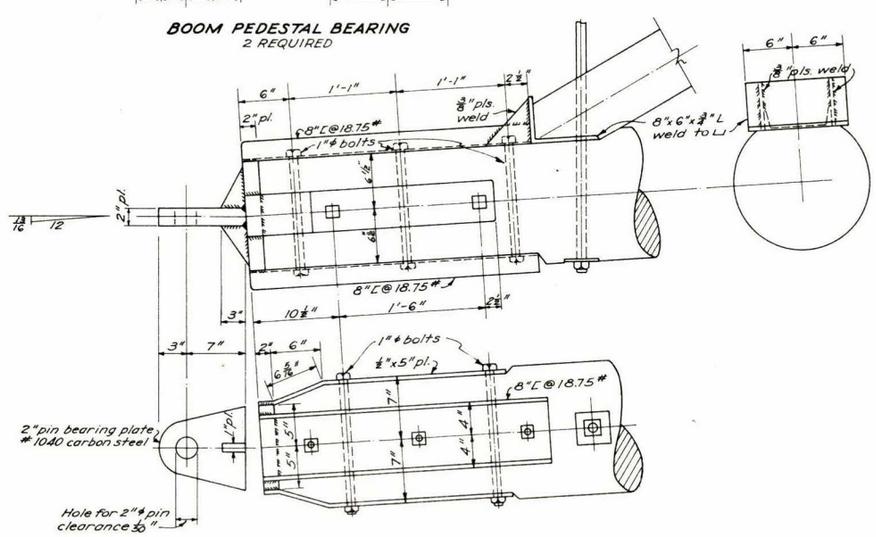
BOOM PEDESTAL BEARING
2 REQUIRED



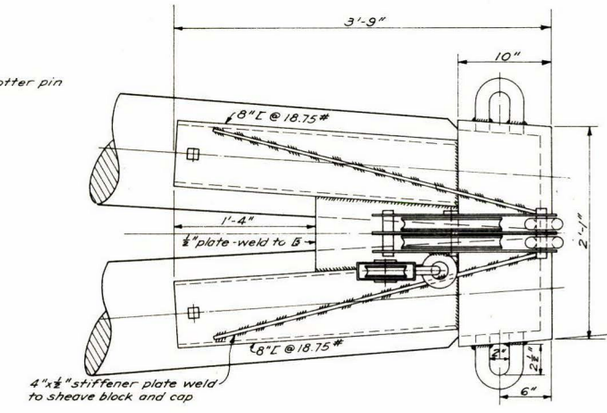
BOOM BEARING PIN DETAIL
2 REQUIRED
SAE #2330 NICKLE STEEL



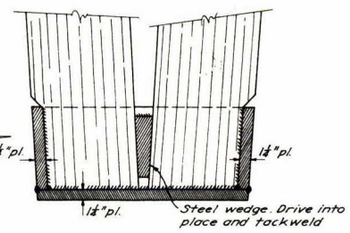
SUPPORT FOR 'A' FRAME CROSS BRACING



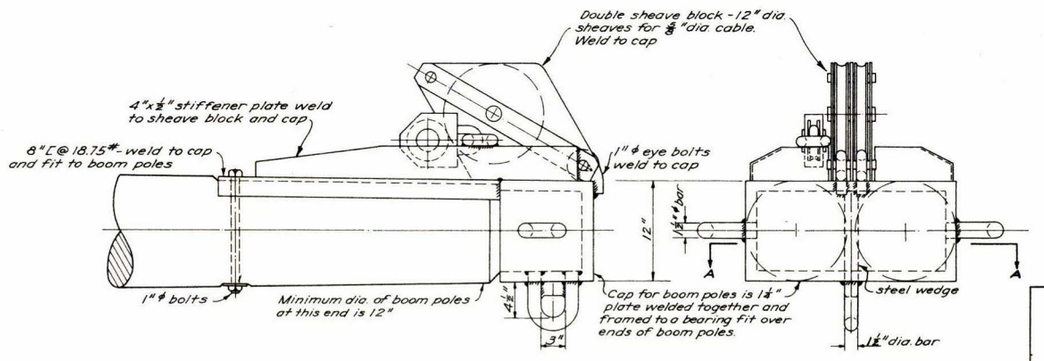
BEARING FOR BASE OF BOOM



TOP VIEW



SECTION A-A


Double sheave block - 12" dia. sheaves for ⅜" dia. cable. Weld to cap
4"x½" stiffener plate weld to sheave block and cap
8"[@ 18.75# - weld to cap and fit to boom poles
1"ϕ eye bolts weld to cap
12"
1¼"ϕ bar
1"ϕ bolts
Minimum dia. of boom poles at this end is 12"
2½"
3"
Cap for boom poles is 1¼" plate welded together and framed to a bearing fit over ends of boom poles.
steel wedge
1½" dia. bar

SIDE VIEW

END VIEW

HEAD BLOCK CAP FOR 'A' FRAME BOOM

Figure 4

CONSTRUCTION DETAILS

BLACKS MOUNTAIN PORTABLE LOG LOADER

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